Estimating friction in cloth, using simulation and machine learning*

A. H. Rasheed[1], V. Romero[1,2], F. Bertails-Descoubes[1], A. Lazarus[2], S. Wuhrer[1], and JS. Franco[1]

[1] Univ. Grenoble Alpes, Inria, CNRS, Grenoble INP, LJK, Grenoble, France
[2] Sorbonne Université, Institut Jean Le Rond d'Alembert, Paris, France

Abstract. We explore the utility of deep neural networks to estimate parameters in cloth motion, specifically the friction coefficient. Our idea is to use realistic cloth motion sequences as video training data for our model and use both spatial and temporal features for parameter estimation. Following recent works, we aim to avoid complex experimental setup for the generation of training data by leveraging cloth simulation as a ground truth model for cloth dynamics. However, this is only meaningful if the simulation is accurate and predictable enough in the range of scenarios envisioned. To ensure realistic simulations, we validate the physical accuracy of Argus, a recent cloth simulator developed in computer graphics which relies on an implicit contact friction solver for capturing exact Coulomb friction. We successfully verify the physical realism of this simulator by conducting physical experiments analogous with simulations, following a protocol previously suggested in literature for measuring Coulomb's friction coefficient in a Hookean elastic material contacting a rigid surface. We further investigate utilizing a similar protocol for cloth with varying material properties, which is modelled as an orthotropic material in the simulator.

Keywords: Cloth simulation · deep learning · Coulomb's friction

* This work was supported by the ERC grant GEM (StG-2014-639139)